

Unit 4.5
Counting Principles
Day 3
Combinations

A Combination is the selection of some or all of the elements of a set WITHOUT regard to order. ORDER is NOT important. For example, the combination of Tom and Charlie is the same as the combination of Charlie and Tom.

Combinations of n elements taken r at a time

If $\binom{n}{r}$ represents the number of combinations of n elements taken r at a time, with $r \leq n$, then

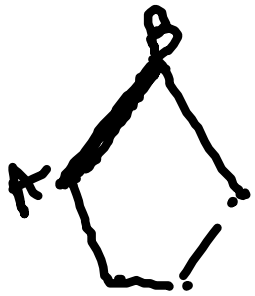
$${}^nC_r = C(n, r) = \binom{n}{r} = \frac{n!}{(n-r)!r!}$$

1) Fifteen people entered a talent contest. The top 3 contestants will each win \$50, everyone else will get an honorable mention. In how many ways can 3 winners be chosen?

$$15^C_3 = 455$$

2) How many lines are determined by 5 points, no 3 of which are collinear? Remember, 2 points determine a line

$${}^5C_2 = 10$$



$$\frac{5!}{3!2!} = \frac{5 \cdot 4}{2 \cdot 1} = 10$$

3) How many different committees of 4 can be chosen from 12 people?

$${}_{12}C_4 = \frac{12!}{4!8!} = \frac{12 \cdot 11 \cdot 10 \cdot 9}{4 \cdot 3 \cdot 2 \cdot 1} = 495$$

4) How many different 5-card hands can be chosen from a 52-card deck?

$$52^C 5 = 2,598,760$$

Homework

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